John E. Jacobsen

Curriculum Vitae

Personal Information:

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Education:

December, 1996:	Ph. D., Department of Physics, University of Wisconsin – Madison.
1993–1996:	Graduate Student, Depts. of Art and Physics, University of Wisconsin – Madison.
1991–1993:	Department of Art, University of Wisconsin – Madison.
1990:	B.S., Physics, University of Wisconsin – Madison. Graduated with distinction, class rank 17 out of 3073.

Research Positions Held:

1998–1999:	Computer Systems Engineer, Physics Division, Lawrence Berkeley National Laboratory, Berkeley, California, USA.
1997–1998:	Postdoctoral Research Associate, Department of Physics, University of Wisconsin, Madison, Wisconsin, USA.
1997–1998:	Visiting Scholar, Department of Physics, University of California, Berkeley, California, USA.
1994–1996:	Graduate Research Assistant, Department of Physics, University of Wisconsin, Madison, Wisconsin, USA.
1993–1994:	United States Department of Education Fellow, Department of Physics, University of Wisconsin, Madison, Wisconsin, USA.
1991–1993:	Undergraduate Physics Research Assistant, Department of Physics, University of Wisconsin, Madison, Wisconsin, USA.
1990–1991:	Physics Research Assistant, CERN, Geneva, Switzerland.
1987–1990:	Undergraduate Physics Research Assistant, Department of Physics, University of Wisconsin, Madison, Wisconsin, USA.

Selected Awards and Honors:

1994:	Emanuelle A. Piori Award (highest score on graduate qualifying exam). University of Wisconsin – Madison Department of Physics.
1993-1994:	U. S. Department of Education Graduate Fellowship. University of Wisconsin – Madison Department of Physics.
1990:	Albert Radtke Scholarship (outstanding undergraduate physics major). University of Wisconsin – Madison Department of Physics.

Technical Proficiencies

Languages: C, C++, Perl, Java, Pascal, FORTRAN, Lisp.

System Administration: Unix (Digital Unix, Linux, Solaris); Windows NT; Mac OS 8.

Additional Operating Systems: Cray, VAX/VMS.

Web Technologies: HTML, Javascript, CGI.

Additional Skills: Socket-level TCP/IP programming; parallel computing; embedded systems programming (ARM).

Research Focus

Most generally, my research has been concerned with high energy physics and astro-particle physics, specifically with the simulation, detection and analysis of high-energy particle processes in interactions of accelerator or cosmic origin. Since 1991, my work has focused on the simulation and analysis of data from the Antarctic Muon and Neutrino Detector Array (AMANDA). This instrument, currently operating at the South Pole with expansion to a size of a cubic kilometer planned over the next several years, uses deep, ultra-transparent Antarctic ice as a medium for particle detection. AMANDA is designed primarily as a neutrino detector, with an eye to solving such puzzles as the origin of the highest energy cosmic rays, the nature of the "missing mass" of the universe, the source of the enigmatic "gamma-ray bursts" (GRBs), and the fate of stars undergoing gravitational collapse (supernova detection).

Design decisions in AMANDA have been driven in part by Monte Carlo simulation to provide optimal detector geometries and data selection procedures. To this end, I created, with the assistance of Serap Tilav and Igor Liubarsky, the `RAVEN` suite of Monte Carlo simulations, which used to provide insights into the design of the AMANDA experiment and the interpretation of its data.

In 1997 and 1998, the focus of my work shifted slightly to the handling of large datasets generated by the AMANDA detector ($\sim$ 500 GB/year). This included data reduction by filtering to reduce backgrounds by an order of magnitude while still keeping 80% of the neutrino signal; the development of automated transfer systems to move data from the South Pole to collaborators through difficult bottlenecks in bandwidth; the development of a standard data format (F2000) for use by the collaboration; the analysis of AMANDA data to search for neutrino events in coincidence with GRBs; and the installation and maintenance of a real-time GRB alert system to allow the immediate analysis of AMANDA data when other space-borne instruments detect bursts.

Most recently, I have focused on the creation of a new technique to record digital phototube waveforms *in situ*, using an embedded system and digital signal transmission to the surface. This allows for maximal time resolution and dynamic range for significantly less cost than the current analog fiber method of signal tranmission.

I also travelled to the Pole twice (1997, 1998) to assist in the deployment and calibration of the AMANDA detector. Both deployments were very successful and helped establish ice as the superior medium for the construction of high-energy neutrino telescopes.

Publications in Refereed Journals:

1. Search for Excited Neutrinos in Z Decays (with ALEPH Collaboration, D. Decamp et. al.), Phys. Lett. **B250** 172-182 (1990).

2. Measurement of Electroweak Parameters from Z Decays into Fermion Pairs (with ALEPH Collaboration, D. Decamp et. al.), Z. Phys. **C48** 365-392 (1990).

3. Using Neural Networks with Jet Shapes to Identify b jets in e^+e^- Interactions (with

L. Bellantoni, J. Conway, Y. Pan and S. L. Wu), Nucl. Instrum. Meth. **A310** 618-622 (1991).

4. Measurement of the Strong Coupling Constant α_S from Global Event Shape Variables of Hadronic Z Decays (with ALEPH Collaboration, D. Decamp et. al.), Phys. Lett. **B255** 623-633 (1991).

5. Measurement of $B - \bar{B}$ Mixing at the Z (with ALEPH Collaboration, D. Decamp et. al.), Phys. Lett. **B258** 236-246 (1991).

6. Measurement of the B Hadron Lifetime (with ALEPH Collaboration, D. Decamp et. al.), Phys. Lett. **B257** 492-504 (1991).

7. Measurement of Charge Asymmetry in Hadronic Z Decays (with ALEPH Collaboration, D. Decamp et. al.), Phys. Lett. **B259** 377-388 (1991).

8. Search for a New Weakly Interacting Particle (with ALEPH Collaboration, D. Decamp et. al.), Phys. Lett. **B262** 139-147 (1991).

9. Charged Particle Pair Production Associated with a Lepton Pair in Z Decays: Indication of an Excess in the Tau Channel (with ALEPH Collaboration, D. Decamp et. al.), Phys. Lett. **B263** 112-122 (1991).

10. Measurement of the Forward-Backward Asymmetry in $Z \to b\bar{b}$ and $Z \to c\bar{c}$ (with ALEPH Collaboration, D. Decamp et. al.), Phys. Lett. **B263** 325-336 (1991).

11. Measurement of the Charged Particle Multiplicity Distribution in Hadronic Z Decays (with ALEPH Collaboration, D. Decamp et. al.), Phys. Lett. **B273** 181-192 (1991).

12. Measurement of the Polarization of τ Leptons Produced in Z Decays (with ALEPH Collaboration, D. Decamp et. al.), Phys. Lett. **B265** 430-444 (1991).

13. Measurement of Isolated Photon Production in Hadronic Z Decays (with ALEPH Collaboration, D. Decamp et. al.), Phys. Lett. **B264** 476-486 (1991).

14. Measurement of the Absolute Luminosity with the ALEPH Detector (with ALEPH Collaboration, D. Decamp et. al.), Z. Phys. **C53** 375-390 (1992).

15. Searches for New Particles in Z Decays Using the ALEPH Detector (with ALEPH Collaboration, D. Decamp et. al.), Phys. Rept. **273** 253-340 (1992).

16. Improved Measurements of Electroweak Parameters from Z Decays Into Fermion Pairs (with ALEPH Collaboration, D. Decamp et. al.), Z. Phys. **C53** 1-20 (1992).

17. An Investigation Into Intermittency (with ALEPH Collaboration, D. Decamp et. al.), Z. Phys. **C53** 21-32 (1992).

18. Possibility that High-Energy Neutrino Telescopes Could Detect Supernovae (with F. Halzen and E. Zas), Phys. Rev. **D49**, n4, p. 1758 (1994).

19. First Data and Future Prospects for AMANDA, the Antarctic Muon and Neutrino Detector Array (with P. Askebjer *et. al.*), Antarctic Journal **24** 337 (1994).

20. Optical Properties of the South Pole Ice at Depths Between 0.8 and 1 Kilometer (with P. Askebjer *et. al.*), Science, Vol. 267, p. 1147 (1995)

21. On the Age vs. Depth and Optical Clarity of Deep Ice at South Pole (with AMANDA collaboration, P. Askebjer *et. al.*), Journal of Glaciology, Vol. 41, No. 139 (1995).

22. Ultratransparent Ice as a Supernova Detector (with F. Halzen and E. Zas), Phys. Rev. **D53**, n12, p. 7359 (1996).

23. UV and Optical Light Transmission Properties in Deep Ice at the South Pole. The AMANDA collaboration (P. Askebjer *et al.*), Geophysical Research Letters **24**, 11, 1355 (1997).

24. Optical Properties of Deep Ice at the South Pole - Absorption. The AMANDA collaboration (P. Askebjer *et al.*), Applied Optics **36**, 18, 4168 (1997).

Selected Presentations:

"Using Neural Networks for b-Jet Identification." ALEPH Collaboration, CERN, Geneva, Switzerland, 23 Oct. 1990.

"A New High-Energy Window on the Heavens... AMANDA." Cornell University, 18 June 1993.

"Particle Physics on Ice: The Antarctic Muon and Neutrino Detector Array." University of Pennsylvania, Rutgers University, Princeton University, 21-23 May 1996.

"The AMANDA Experiment at South Pole." Yerkes Observatory, Williams Bay, Wisconsin, 10 June 1996.

"Data Analysis and Simulation Software for the AMANDA Experiment." ICECUBE Workshop, University of California – Irvine, 27 March, 1998.

Publications in Conference Proceedings:

1. VHE Gamma Ray Studies at the Haleakala Gamma Ray Observatory (with L. Resvanis *et. al.*), Nucl. Phys. B, Proc. Suppl. 14A, pp. 205-210 (1989).

2. Searches for the Standard Higgs Boson Produced in the Reaction $e^+e^- \to H^0Z^*$ (with ALEPH Collaboration, D. Decamp *et. al.*), Contribution to the Aspen, La Thuile and Moriond Conferences (Winter 1991).

3. Transparency of Antarctic Ice: First Results (with AMANDA collaboration, S. Barwick *et. al.*), *The Workshop on Astrophysics of High Energy Neutrinos*, Honolulu, Hawaii (1992).

4. Antarctic Muon and Neutrino Detector Array (with AMANDA collaboration, S. Barwick *et. al.*), *Proceedings of the 2nd UCLA International Conference on Gamma Ray and Neutrino Cosmology*, Los Angeles, California (1992).

5. AMANDA: South Pole Neutrino Detector (with AMANDA collaboration, S. Barwick *et. al.*), *Proceedings of the XXVIth International Conference on High Energy Physics (ICHEP 92)*, Dallas, Texas (1992).

6. AMANDA: Design of a 1 Kilometer Deep High Energy Neutrino Telescope (with AMANDA collaboration, S. Tilav *et. al.*), *Proceedings of the XXIIIrd International Cosmic Ray Conference*, Calgary, Canada (1993).

7. Surface/Under Ice Muon Coincidences at the South Pole (with S. Tilav *et. al.*), *Proceedings of the XXIIIrd International Cosmic Ray Conference*, Calgary, Canada (1993).

8. AMANDA: Measurement of South Pole Ice Transparency at 800 Meter Depth (with AMANDA collaboration, T. Miller *et. al.*), *Proceedings of the XXIIIrd International Cosmic Ray Conference*, Calgary, Canada (1993).

9. Hardware Design and Prototype Tests of the AMANDA Neutrino Detector (with AMANDA collaboration, D. Lowder *et. al.*), *Proceedings of the XXIIIrd International Cosmic Ray Conference*, Calgary, Canada (1993).

10. Ultra High Energy Neutrino Astrophysics with AMANDA (with AMANDA Collaboration, P. B. Price *et. al.*), *Proceedings of the International Conference on Non-Accelerator Particle Physics*, Bangalore, India (1994).

11. The Indirect Detection of Halo Dark Matter (with F. Halzen). *Proceedings of the International Conference on Critique of the Sources of Dark Matter in the Universe*, UCLA, Los Angeles, California (1994).

12. Antarctic Muon and Neutrino Detector: First Data and Outlook (with John Lynch and the AMANDA Collaboration), *Proceedings of the Rpobotic Telescopes Conference, Astronomical Society of the Pacific*, Flagstaff, Arizona (1994).

13. AMANDA: Status Report from the 1993-94 Campaign and Optical Properties of the South Pole Ice (with AMANDA Collaboration, P. Askebjer *et. al.*), To appear in the *Proceedings of the XVI International Conference on Neutrino Physics and Astrophysics*, Eilat, Israel (1994).

14. The Detection of Cold Dark Matter with Neutrino Telescopes (with F. Halzen), University of Wisconsin Preprint MAD-PH-838. *Proceedings of the 16th Annual Montreal-Rochester-Syracuse-Toronto Meeting on High Energy Physics: What Next? Exploring the Future of High Energy Physics*, Montreal, Canada (1994).

15. Initial Analysis of Coincident Events Between the SPASE and AMANDA Detectors (with T. Miller *et. al.*), *Nuclear Physics B, Proc. Supp.* **43**, 245 (1995).

16. Ultra-transparent Antarctic Ice as a Supernova Detector (with F. Halzen and E. Zas), *Proceedings of the XXIVth International Cosmic Ray Conference*, Rome, Italy (1995).

17. A System to Search for Supernova Bursts with the AMANDA Detector (with AMANDA collaboration, R. Wischnewski *et. al.*), *Proceedings of the XXIVth International Cosmic Ray Conference*, Rome, Italy (1995), Vol. 1, p. 658.

18. Status and Capabilities of AMANDA-94 (with AMANDA collaboration, P. Mock *et. al.*), *Proceedings of the XXIVth International Cosmic Ray Conference*, Rome, Italy (1995), Vol. 1, p. 758.

19. Measurements of the Absorption Length of the Ice at the South Pole in the Wavelength Interval 410 nm to 610 nm (with AMANDA collaboration, B. Erlandsson *et. al.*), *Proceedings of the XXIVth International Cosmic Ray Conference*, Rome, Italy (1995), Vol. 1, p. 1039.

20. The Design of a Neutrino Telescope using Natural Deep Ice as a Particle Detector (with AMANDA collaboration, L. Gray *et. al.*), *Proceedings of the XXIVth International Cosmic Ray Conference*, Rome, Italy, 1995), Vol. 1, p. 816.

21. Indirect Evidence for Long Absorption Lengths in Antarctic Ice (with AMANDA collaboration, S. Tilav *et. al.*), *Proceedings of the XXIVth International Cosmic Ray Conference*, Rome, Italy (1995), Vol. 1, p. 1011.

22. Optical Properties of South Pole Ice for Neutrino Astrophysics (with AMANDA collaboration, P. B. Price *et. al.*), *Proceedings of the XXIVth International Cosmic Ray Conference*, Rome, Italy (1995), Vol. 1, p. 777.

23. SPASE-AMANDA Coincidences at the South Pole (with T. Miller *et. al.*), *Proceedings of the XXIVth International Cosmic Ray Conference*, Rome, Italy (1995), Vol. 2, p. 768.

24. Remote Surveys of AMANDA (with R. Porrata *et. al.*), *Proceedings of the XXIVth International Cosmic Ray Conference*, Rome, Italy (1995), Vol. 1, p. 1009.

25. Using Extra-clear Antarctic Ice as a Supernova Detector (with F. Halzen and E. Zas). *Proceedings of the XXIVth International Cosmic Ray Conference*, Rome, Italy (1995), Vol. 1, p. 1027.

26. 1995-96 Results for the AMANDA Neutrino Observatory, (with the AMANDA Collaboration, P. B. Price *et. al.*), *Proceedings of the* 7^{th} *International Workshop on Neutrino Telescopes*, p.383, Venice, Italy (1996).

27. 1995-1996 Results for the AMANDA Neutrino Observatory (with P. Askebjer *et. al.*), *Proceedings of the International Workshop on Future Prospects of Baryon Instability Search*, Oak Ridge National Laboratory (1996), Yu. Kamyshkov, ed.

28. The AMANDA Experiment (with the AMANDA Collaboration, P. O. Hulth *et. al.*), *Proceedings of the* 17^{th} *International Conference on Neutrino Physics and Astrophysics (Neutrino 96)*, p.518, Helsinki, Finland (1996).

29. Status of the AMANDA South Pole Neutrino Detector (with the AMANDA collaboration, F. Halzen *et. al.*), *Proceedings of the International Workshop on Aspects of Dark Matter in Astrophysics and Particle Physics*, Heidelberg, Germany (1996).

30. 1995-96 Results for the AMANDA Neutrino Observatory (with the AMANDA Collaboration, P. B. Price *et. al.*), *Proceedings of the* 7^{th} *International Workshop on Neutrino Telescopes*, p.383, Venice, Italy (1996).

31. Latest Results from AMANDA (with the AMANDA collaboration, P.B. Price *et. al.*), in *Proc. XXXIInd Rencontres de Moriond ("Very High Energy Phenomena in the Universe")*, Les Arcs, France (1997).

32. The Status of the AMANDA High-Energy Neutrino Detector (with the AMANDA collaboration, S.W. Barwick *et. al.*), *Proceedings of the 25th International Cosmic Ray Conference*, Durban, South Africa, Vol. 7, 1 (1997).

33. THE AMANDA EXPERIMENT: status and prospects for indirect Dark Matter detection (with the AMANDA Collaboration, L. Bergström *et. al.*), *Proceedings of the International Workshop on the Identification of Dark Matter (IDM 96)*, Sheffield, England, 1996, Edited by N.J.C. Spooner, p.521 (1997).

34. First Look at AMANDA-B Data (with the AMANDA collaboration, S. Tilav *et. al.*), *Proceedings of the 25th International Cosmic Ray Conference*, Durban, South Africa, Vol. 7, 5 (1997).

35. Analysis of Cascades in AMANDA-A, (with the AMANDA collaboration, R. Porrata *et. al.*), *Proceedings of the 25th International Cosmic Ray Conference*, Durban, South Africa, Vol. 7, 9 (1997).

36. Muon Reconstruction with AMANDA-B, (with the AMANDA collaboration, C.H. Wiebusch *et. al.*), *Proceedings of the 25th International Cosmic Ray Conference*, Durban, South Africa, Vol. 7, 13 (1997).

37. Analysis of SPASE-AMANDA Coincidence Events (with the SPASE and AMANDA collaborations, T.C. Miller *et. al.*), *Proceedings of the 25th International Cosmic Ray Conference*, Durban, South Africa, Vol. 5, 237 (1997).

38. Status of the AMANDA and BAIKAL Neutrino Telescopes (with the AMANDA and BAIKAL Collaborations, P. Askebjer *et. al.*), *Proc. 9th Intern. Symp. on Very High Energy Cosmic Ray Interactions*, Karlsruhe, Germany, 1996, Edited by H. Rebel *et. al.*, Nucl. Phys. B Suppl. 52B:256 (1997).

39. Up- and down-going muons in the AMANDA-B4 prototype detector (with the AMANDA Collaboration, S. Hundertmark *et. al.*), *Proceedings of the 26th International Cosmic Ray Conference*, Salt Lake City, USA (1999, in press).

40. Digital Optical Module and System Design for a Km-Scale Neutrino Detector in Ice (with the AMANDA Collaboration, D.M. Lowder *et. al.*), *Proceedings of the 26th International Cosmic Ray Conference*, Salt Lake City, USA (1999, in press).

41. AMANDA Search for High-Energy Neutrinos Accompanying Gamma Ray Bursts (with the AMANDA Collaboration, Ryan Bay *et. al.*), *Proceedings of the 26th International Cosmic Ray Conference*, Salt Lake City, USA (1999, in press).

42. From the First Neutrino Telescope, the Antarctic Muon and Neutrino Detector Array AMANDA, to the IceCube Observatory, (with the AMANDA Collaboration F. Halzen *et. al.*), *Proceedings of the 26th International Cosmic Ray Conference*, Salt Lake City, USA (1999, in press).

43. Optical Properties of South Pole Ice at Depths from 140 to 2300 Meters (with the AMANDA Collaboration, Kurt Woschnagg *et. al.*), *Proceedings of the 26th International Cosmic Ray Conference*, Salt Lake City, USA (1999, in press).

44. Search for relativistic monopoles with the AMANDA detector (with the AMANDA Collaboration, Peter Niessen *et. al.*), *Proceedings of the 26th International Cosmic Ray Conference*, Salt Lake City, USA (1999, in press).

45. Observation of Atmospheric Neutrino Events with AMANDA (with the AMANDA Collaboration, A. Karle *et. al.*), *Proceedings of the 26th International Cosmic Ray Conference*, Salt Lake City, USA (1999, in press).

46. The AMANDA-B 10 String Array (with the AMANDA Collaboration, Gary C. Hill *et. al.*), *Proceedings of the 26th International Cosmic Ray Conference*, Salt Lake City, USA (1999, in press).

47. A search for point sources of high energy neutrinos with the AMANDA neutrino telescope (with the AMANDA Collaboration, J.H. Kim *et. al.*), *Proceedings of the 26th International Cosmic Ray Conference*, Salt Lake City, USA (1999, in press).

48. Status of the RICE Experiment, (with the AMANDA Collaboration, G.M. Frichter *et. al.*), *Proceedings of the 26th International Cosmic Ray Conference*, Salt Lake City, USA (1999, in press).

49. Seasonal variation of the muon flux seen by AMANDA (with the AMANDA Collaboration, by A. Bouchta *et. al.*), *Proceedings of the 26th International Cosmic Ray Conference*, Salt Lake City, USA (1999, in press).

50. Supernova Burst Analysis with the Amanda Neutrino Telescope (with the AMANDA Collaboration, R. Wischnewski *et. al.*), *Proceedings of the 26th International Cosmic Ray Conference*, Salt Lake City, USA (1999, in press).

51. Calibration of AMANDA with Coincident Events from SPASE-2 (with the AMANDA Collaboration, T.C. Miller *et. al.*), *Proceedings of the 26th International Cosmic Ray Conference*, Salt Lake City, USA (1999, in press).

52. Nearly vertical upgoing muons in the AMANDA-B10 detector (with the AMANDA Collaboration, Eva Dalberg *et. al.*), *Proceedings of the 26th International Cosmic Ray Conference*, Salt Lake City, USA (1999, in press).